n	t_{95}	n	t_{95}	n	t_{95}
2	6.31	12	1.80	22	1.72
3	2.92	13	1.78	23	1.72
4	2.35	14	1.77	24	1.71
5	2.13	15	1.76	25	1.71
6	2.02	16	1.75	26	1.71
7	1.94	17	1.75	27	1.71
8	1.90	18	1.74	28	1.70
9	1.86	19	1.73	29	1.70
10	1.83	20	1.73	30+	1.70
11	1.81	21	1.72	.....	.....

(2) Calculate the standard deviation, σ, or the test sample using the following formula:

$$\sigma = \sqrt{\frac{\sum (X_i - x)^2}{n-1}}$$

Where:

X_i = Emission test result for an individual vehicle or engine.

(d) Use final deteriorated test results to calculate the variables in the equations in paragraph (c) of this section (see § 1051.315(a)).

(e) After each new test, recalculate the required sample size using the updated mean values, standard deviations, and the appropriate 95-percent confidence coefficient.

(f) Distribute the remaining vehicle or engine tests evenly throughout the rest of the year. You may need to adjust your schedule for selecting vehicles or engines if the required sample size changes. Continue to randomly select vehicles or engines from each engine family.

(g) Continue testing any engine family for which the sample mean, x, is greater than the emission standard. This applies if the sample mean for either HC, NO_X (or HC+NO_X) or CO (or other regulated pollutants) is greater than the emission standard. Continue testing until one of the following things happens:

(1) The number of tests completed in an engine family, n, is greater than the required sample size, N, and the sample mean, x, is less than or equal to the emission standard. For example, If N = 3.1 after the third test, the sample-size calculation does not allow you to stop testing.

(2) The engine family does not comply according to § 1051.315.

(3) You test 30 vehicles or engines from the engine family.

(4) You test one percent of your projected annual U.S.-directed production volume for the engine family, rounded to the nearest whole number.

(5) You choose to declare that the engine family fails the requirements of this subpart.

(h) If the sample-size calculation allows you to stop testing for a pollutant, you must continue measuring emission levels of that pollutant for any additional tests required under this section. However, you need not continue making the calculations specified in this section for that pollutant. This paragraph does not affect the requirements in section § 1051.320.

(i) You may elect to test more randomly chosen vehicles or engines than we require under this section. Include these vehicles or engines in the sample-size calculations.

[67 FR 68347, Nov. 8, 2002, as amended at 70 FR 40498, July 13, 2005]

§ 1051.315 How do I know when my engine family fails the production-line testing requirements?

This section describes the pass-fail criteria for the production-line testing requirements. We apply these criteria on an engine family basis. See § 1051.320 for the requirements that apply to individual vehicles or engines that fail a production-line test.

(1) *Initial and final test results.* Calculate and round the test results for each vehicle or engine. If you do several tests on a vehicle or engine, calculate the initial test results, then add them together and divide by the number of tests and round for the final test results on that vehicle or engine.

(2) *Final deteriorated test results.* Apply the deterioration factor for the engine family to the final test results (see § 1051.240(c)).

(b) Construct the following CumSum Equation for each engine family for HC, NO_X (or HC+NO_X), and CO emissions (and other regulated pollutants):

$$C_i = C_{i-1} + X_i - (STD + 0.25 \times \sigma)$$

Where:

C_i = The current CumSum statistic.

C_{i-1} = The previous CumSum statistic. For the first test, the CumSum statistic is 0 (*i.e.* $C_1 = 0$).

X_i = The current emission test result for an individual vehicle or engine.
STD = Emission standard.

(c) Use final deteriorated test results to calculate the variables in the equation in paragraph (b) of this section (see §1051.315(a)).

(d) After each new test, recalculate the CumSum statistic.

(e) If you test more than the required number of vehicles or engines, include the results from these additional tests in the CumSum Equation.

(f) After each test, compare the current CumSum statistic, C_i, to the recalculated Action Limit, H, defined as $H = 5.0 \times \sigma$.

(g) If the CumSum statistic exceeds the Action Limit in two consecutive tests, the engine family fails the production-line testing requirements of this subpart. Tell us within ten working days if this happens. You may request to amend the application for certification to raise the FEL of the engine family at this point if you meet the requirements of §1051.225(f).

(h) If you amend the application for certification for an engine family under §1051.225, do not change any previous calculations of sample size or CumSum statistics for the model year.

[67 FR 68347, Nov. 8, 2002, as amended at 70 FR 40499, July 13, 2005]

§1051.320 What happens if one of my production-line vehicles or engines fails to meet emission standards?

(a) If you have a production-line vehicle or engine with final deteriorated test results exceeding one or more emission standards (see §1051.315(a)), the certificate of conformity is automatically suspended for that failing vehicle or engine. You must take the following actions before your certificate of conformity can cover that vehicle or engine:

(1) Correct the problem and retest the vehicle or engine to show it complies with all emission standards.

(2) Include in your written report a description of the test results and the remedy for each vehicle or engine (see §1051.345).

(b) You may request to amend the application for certification to raise the FEL of the entire engine family at this point (see §1051.225).

§1051.325 What happens if an engine family fails the production-line requirements?

(a) We may suspend your certificate of conformity for an engine family if it fails under §1051.315. The suspension may apply to all facilities producing vehicles or engines from an engine family, even if you find noncompliant vehicles or engines only at one facility.

(b) We will tell you in writing if we suspend your certificate in whole or in part. We will not suspend a certificate until at least 15 days after the engine family fails. The suspension is effective when you receive our notice.

(c) Up to 15 days after we suspend the certificate for an engine family, you may ask for a hearing (see §1051.820). If we agree before a hearing that we used erroneous information in deciding to suspend the certificate, we will reinstate the certificate.

(d) Section 1051.335 specifies steps you must take to remedy the cause of the engine family's production-line failure. All the vehicles you have produced since the end of the last test period are presumed noncompliant and should be addressed in your proposed remedy. We may require you to apply the remedy to engines produced earlier if we determine that the cause of the failure is likely to have affected the earlier engines.

(e) You may request to amend the application for certification to raise the FEL of the engine family before or after we suspend your certificate if you meet the requirements of §1051.225(f).

[67 FR 68347, Nov. 8, 2002, as amended at 70 FR 40499, July 13, 2005]

§1051.330 May I sell vehicles from an engine family with a suspended certificate of conformity?

You may sell vehicles that you produce after we suspend the engine family's certificate of conformity under §1051.315 only if one of the following occurs:

(a) You test each vehicle or engine you produce and show it complies with emission standards that apply.

(b) We conditionally reinstate the certificate for the engine family. We may do so if you agree to recall all the affected vehicles and remedy any noncompliance at no expense to the owner